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HIGH OHMIC RESISTANCE FOR VACUUM TUBE AMPLIFIERS

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To produce higher amplification, a very high ohmic resistance is necessary for the grid-cathode circuit of the amplifier tube. Therefore, with a tube whose transconductance is 50 microamps/volt, current amplification of 100,000 requires a resistance of 2 x 10^9 ohms or 2000 megohms. Such large resistors cannot normally be purchased and, therefore, it is necessary to make them out of available materials when constructing laboratory amplifiers.

This difficulty was surmounted by using black light-tight paper, ordinarily used to pack photographic films and plates, having a specific resistance of 1 x 10^6 ohms/cm. The value of the resistivity for various papers may vary considerably depending on the concentration and type of dye used on them and on the degree of dampness of the paper. Thus, with a 0.1-mm thickness of paper, 2 mm wide and 4 cm long, a resistance of 2000 megohms was obtained. The ends of the paper were fastened with thin (0.2-mm) soft brass, and the resistor was then immersed in vinylite or a similar lacquer to keep out the moisture. The value of the resistor can be controlled by using a galvanometer with a scale graduated in megohms inserted in a simple current voltage circuit. The necessary resistor dimensions can then be determined.

Resistances of from 100 to 5000 megohms were obtained by this method. Measurements showed that two or three days after the resistors were covered with lacquer (a solution of plexiglas in dichloroethane was used) their resistance would increase by 10-15 percent because of an increase in the insulating properties of the lacquer when it dried out and polymerized. Observations over a period of 3 months failed to show any further change in resistance due to aging of the paper or the lacquer film.

The temperature coefficient of the resistors was investigated in the range 10-30°C, and was found to be only 0.03 percent per degree.

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